Remarks/Arguments

Claim Rejections – first paragraph of 35 USC §112

Claim 23 is cancelled.

Applicant appreciate Examiner Hirl's points and have revised claims 7 and 11 to enable the make and/or use of the invention.

Claim 7 is amended to describe the confidence value for a class in full, clear, concise, and exact manner based on the non-terminal node branch likelihood values and the likelihood value for class c at terminal node. The non-terminal node branch likelihood values are clearly described in the specification page 12 (paragraphs [0076] and [0077]). The likelihood value for class c at terminal node is clearly described in the specification page 11 (paragraphs [0069] to [0071]).

Claim 11 is amended to describe the terms N^n and N_c^n in full, clear, concise, and exact manner and is consistent with the specification page 8 lines 1 and 2 (paragraph [0052]).

Applicant respectfully submits that the changes overcome Examiner Hirl's first paragraph of 35 USC §112 rejections.

Claim Rejections – 35 USC §101

Examiner Hirl states:

"Claims 1-24 are rejected under 35 USC 101 because the claimed invention is directed to non-statutory subject matter. The language of the claim raises a question as to whether the claim is directed merely to an abstract idea that is not tied to a technology art, environment or machine which would result in a practical application producing a concrete, useful, and tangible result to form the basis of statutory subject matter under 35 USC §101. While the problem maybe trivial, the invention maybe implemented using pencil and paper and is therefore not embodied in the technical arts"

Applicant appreciate Examiner Hirl's points and have revised the independent claims 1, 5, 8, 10, 12, 14, 17, 20 and 22 to clearly state "in intelligent system applications to regulate the quality of the decision rules automatically" in the first parts of the claims setting forth the environment of the invention.

This should clearly direct toward producing concrete, useful, and tangible result to practical applications because "regulate the quality of the decision rules automatically" and "intelligent system application" are described in the specification pages 1-3 (paragraphs [0001] - [0011]) that clearly states the related practical applications such as data mining, automatic process control, automatic target recognition, intelligent database

search, data warehousing, and machine vision. The AUTOMATIC regulation of the quality of the decision rules clearly excludes the MANUAL implementation using pencil and paper.

Applicant respectfully submits that the changes overcome Examiner Hirl's 35 USC §101 rejections.

Claim Rejections – 35 USC §103

Claims 1-10, 12-22 and 24 are rejected by Examiner Hirl under 35 U.S.C. 103(a) as being unpatentable over Berry and APA.

To help clarifying our claim based replies, applicant would like to point out the fundamental differences between the current invention and Berry as well as the key inventive features as follows:

- The regulation tree of the current invention is a post-processing step of the existing decision trees. Therefore, the regulation tree of the current invention has the same structure as the existing decision tree. The existing decision tree can be initially generated using the methods such as CART (Berry p. 252-259), C4.5 (Berry p. 259-265), or CHAID (Berry p.265-267) or other methods. The regulation tree of the current invention additionally derives and stores statistics at each node of the existing tree. This results in improved quality of the decision rules.
- Berry described the initial generation of the existing decision trees. The training samples in Berry's descriptions are used for initially creating the structure of the trees. Therefore, the measures derived from the training samples in Berry are used to construct the tree such as determining the best split of the tree (Berry p. 254, lines 1-37, p 255, lines 1-11). The measures are discarded after use. They are not stored in the tree. The regulation tree of the current invention derives statistics from the training samples, which are not used to split a tree (since the structure is fixed). The additional statistics are stored at each node of the existing tree for regulated decision. They are distinctively different from Berry's measures.
- The current invention uniquely includes regulation parameters. One regulation parameter, α, regulates the adjustable condition between the crisp tree and the probabilistic tree (see specification pages 12-13, paragraphs [0076] - [0079]). Another regulation parameter, β, weakens the likelihood values for terminal nodes having a small number of training samples (see specification pages 11, paragraphs [0070] - [0071]). These are completely new methods and are un-suggested in prior arts including Berry.
- After the regulation tree construction step of the current invention, post-processing statistics are stored at each node of the existing tree. Therefore, in the regulation tree application (rather than regulation tree construction) for an unknown sample (rather than the training samples), the likelihood values for the tree nodes associated with the unknown sample have to be determined to generate confidence value for final decision. This is patently different from the prior art decision tree application which

is described in Berry that enters a record (new sample) at the root node and follows an unique path until reaches a single leaf node, then classifies the record by the class label associated with the leaf node (Berry, p. 244 lines 33-40)

- After the regulation tree construction of the current invention, the statistics at the nodes (including non-terminal node and terminal node) of a regulation tree can be incrementally updated using one additional training sample at a time. This is a patentable new method and is un-suggested in prior arts including Berry.
- After the regulation tree construction of the current invention, a regulation tree can be updated to include new classes and new trees, these together form a compound tree. This is a patentable new method and is un-suggested in prior arts including Berry.
- After a compound tree of the current invention is constructed. A special compound tree application method is applied to an unknown sample (rather than training samples). The compound tree application method applies the sample to all trees and combines the result. This is a patentable new method and is un-suggested in prior arts including Berry.
- A focusing tree construction method that automatically weighs the training samples using the initial decision tree and uses the new weights to create a new focusing tree. This is a patentable new method and is un-suggested in prior arts including Berry.
- A focusing tree application method that conditionally selects the final result from the first tree and the focusing tree. This is a patentable new method and is un-suggested in prior arts including Berry.

The detailed remarks are discussed for each claim as follows

Claim 1

(a) Berry (p.252, line 9) does not teach the input of an existing decision tree for post-processing. Neither did Berry suggest any tree regulation on an initially created (existing) tree. Current invention is patentably distinctive from Berry.

Claim 1, step (a) is amended to clearly state the input is an existing decision tree.

(c) Berry (p. 254, lines 1-37, p 255, lines 1-11) does not teach the determination of statistics and store in the existing decision tree structure for tree regulation. Berry taught measures used to change the structure of the tree such as determining the best split of the tree. The measures are discarded after use. They are not stored in the tree. Current invention is patentably distinctive from Berry.

Claim 1, step (c) is amended to clearly state the statistics are stored in the decision tree structure.

(d) Berry (p. 255, lines 27-28) does not teach the determination of statistics and store in the existing decision tree structure for tree regulation. Berry taught measuring error rate to assign class to a leaf. Current invention is patentably distinctive from Berry.

Claim 1, step (d) is amended to clearly state the statistics are stored in the decision tree structure.

(e) Berry (p. 254, lines 1-37, p 255, lines 1-11) does not teach select regulation parameters. Neither did it anticipate or suggest regulation parameters. Current invention is patentably distinctive from Berry.

Applicant respectfully submits that the amended claim 1 is patentably over the prior art and the claim is in condition for allowance based on the above arguments.

Claims 2-3
Examiner Hirl acknowledged that Berry does not teach the statistics including mean distance or distance standard deviation. However, Examiner Hirl stated that it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Berry to establish statistical metrics to include mean distance or distance standard deviation.

Applicant respectfully submits that Claim 2 and claim 3 are not anticipated by Berry and Berry does not motivate the post-processing statistics for those ordinary skilled in the art. In fact, Berry teaches away from the current invention, which is a post-processing step for decision quality regulation. This is because the measures of Berry are only for tree spiting that is for the initial generation of the decision trees. An ordinary skill in the art would have confined their methods to the initial generation rather than post-processing of tree due to the teaching of Berry. This is why even though many of the methods described in Berry have been disclosed for over 20 years (such as CART) yet no post-processing statistics for existing decision trees such as the statistics in the current invention have been conceived in the prior arts.

Applicant respectfully traverse Examiner Hirl's rejections based on the above arguments.

Claim 4
Examiner Hirl stated that likelihood is similar to probability which is similar to diversity as in Berry (p. 254, lines 4-10). Applicant respectfully submits that the diversity of Berry is a measure for the potential splitter. The measure of potential splitter is only useful for the splitting of tree nodes in the initial construction of trees. Claim 4 is for the post-processing statistics for existing decision trees which is patently distinctive from the diversity as in Berry.

Applicant respectfully traverse Examiner Hirl's rejections based on the above arguments.

Claim 5
(a) Berry (p.253, line 6) does not teach the input of a sample with unknown class for tree application. Instead, Berry inputs the complete training set of preclassified records (known classes) for tree construction. Current invention is patentably distinctive from Berry.

(b), (c) Berry (p.255, lines 6-11) does not teach the determination of the likelihood values in tree application for a sample with unknown class. Instead, Berry taught the choose of the best splitter using decrease in diversity as the measure of goodness. The diversity is determined from training set of preclassified records (known classes) for tree construction. Current invention is patentably distinctive from Berry.

(d) Berry (p.256, lines 4-7) does not teach the determination of the confidence values in tree application for a sample with unknown class. Instead, Berry taught the calculation of the error rate of an entire tree using the training set of preclassified records (known classes) for tree construction. Current invention is patentably distinctive from Berry.

Applicant respectfully traverse Examiner Hirl's rejections based on the above arguments.

Claim 6

Examiner Hirl stated that likelihood is similar to probability which is similar to diversity and the binary split are left and right as in Berry (p. 254, lines 4-10). Applicant respectfully submits that the diversity of Berry is a measure for the potential splitter. The measure of potential splitter is only useful for the splitting of tree nodes in the construction of trees. In claim 6, the likelihood value is for the regulation tree application of a sample with unknown class for tree application, which is patently distinctive from the diversity as in Berry.

Applicant respectfully traverse Examiner Hirl's rejections based on the above arguments.

Claim 8

(a) Berry (p.256, lines 4-7) does not teach the determination of the projected tree accuracies for a plurality of depths and a plurality of regulation parameter values. Instead, Berry taught the calculation of the error rate of an entire tree at a fixed depth. The current invention uniquely defines regulation parameters that regulates the adjustable condition between the crisp tree and the probabilistic tree and weakens the likelihood values for terminal nodes having a small number of training samples. These are completely new methods and are un-suggested in prior arts.

(b) Examiner Hirl stated that optimum depth is established by diversity provided by the best splitter (Berry p.255, lines 6-11) which established levels or depth. Applicant respectfully submits that the best splitter only determines the best rule for splitter at a node. It does not determine the optimum depth. The optimum depth can only be established after the accuracies of a plurality of depths are assessed which is a unique inventive step of the current invention that is not taught in Berry.

(c) Berry (p.253, lines 6-12; p 254, lines 1-37; p 255, lines 1-11) does not teach the use of optimal regulation parameter value for the optimal depth. The current invention uniquely defines regulation parameters that are completely new methods and are un-suggested in prior arts. Instead, Berry taught measures used to determining the best split of the tree.

Applicant respectfully traverse Examiner Hirl's rejections based on the above arguments.

Claim 9
Berry (p.253, lines 6-12; p 254, lines 1-37; p 255, lines 1-11) does not teach the determination of a regulation parameter value based on projected tree accuracy. The current invention uniquely defines regulation parameters that are completely new methods and are un-suggested in prior arts. Instead, Berry taught measures used to determining the best split of the tree.

Applicant respectfully traverse Examiner Hirl's rejections based on the above arguments.

Claims 10, 12
(a) Berry (p. 253, line 6) inputs the complete training set. It does not teach the input of a single new training sample for update learning. Current invention is patentably distinctive from Berry.

(d) Berry (p. 248, lines 3-12) does not teach the update of the terminal statistics stored in the regulation tree. The incremental update using one additional training sample is a patentable new method and is un-suggested in prior arts

Applicant respectfully traverse Examiner Hirl's rejections based on the above arguments.

Claim 13
Examiner Hirl acknowledged that Berry does not teach the non-terminal node statistics including mean distance and distance standard deviation. However, Examiner Hirl stated that it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Berry to establish statistical metrics to include mean distance and distance standard deviation.

Applicant respectfully submits that Claim 13 is not anticipated by Berry and Berry does not motivate the post-processing non-terminal node statistics update using a single new training sample. In fact, Berry teaches away from the current invention. This is because the measures of Berry are only for tree spiting for the initial generation of the decision trees using the complete set of the training samples. An ordinary skill in the art would have confined their methods to the initial generation of tree rather than tree update due to the teaching of Berry. This is why even though many of the methods described in Berry have been disclosed for over 20 years (such as CART) yet no post-processing non-terminal node statistics update for existing decision trees have ever been conceived in the prior arts.

Applicant respectfully traverse Examiner Hirl's rejections based on the above arguments.

Claim 14
(a) Berry (p.253, lines 6-12; p 254, lines 1-37; p 255, lincs 1-11) teaches the measures used to determining the best split of the tree. It is for the construction of the original tree with the original classes rather than the construction of the new regulation tree construction in addition to the original regulation tree. The construction of the additional new tree for new classes is a new patentable method and is un-suggested in prior arts.

Claim 14, step (a) is amended to clearly state the in addition to the original regulation tree.

(b) Examiner Hirl stated that the compound tree update is repeating the process of Berry (p.253, lines 6-12; p 254, lines 1-37; p 255, lines 1-11). The repeating tree construction with additional new classes is one of the essence of the invention and is non-obvious and un-suggested by Berry.

Applicant respectfully submits that the amended claim 14 is patentably over the prior art and the claim is in condition for allowance based on the above arguments.

Claim 15
(a) Berry (p. 253, line 6) inputs the complete training set. It does not teach the incremental input of a sample from a new class. Update a regulation tree to include a new class after the regulation tree construction is a patentable new method and is un-suggested in prior arts.

(b) Berry (p.253, lines 6-12; p 254, lines 1-37; p 255, lines 1-11) does not teach the sample size confirmation. It teaches the measures used to determining the best split of the tree. Current invention is patentably distinctive from Berry.

(c) Berry (p.253, lines 6-12; p 254, lines 1-37; p 255, lines 1-11) does not teach the construction of a new compound tree for all existing classes and the new classes. It teaches the measures used to determining the best split of the tree only for the existing classes. Current invention is patentably distinctive from Berry.

Applicant respectfully traverse Examiner Hirl's rejections based on the above arguments.

Claim 16
(a) Berry (p. 253, line 6) inputs the complete training set. It does not teach the incremental input of a new sample. Update a regulation tree to include a new class after the regulation tree construction is a patentable new method and is un-suggested in prior arts.

(b) Examiner Hirl stated that the update or current information is a repeat of the initial process of Berry (p.253, lines 6-12; p 254, lines 1-37; p 255, lines 1-11). The repeating tree construction with additional new classes and tree statistics update are among the essence of the invention and are non-obvious and un-suggested by Berry.

Applicant respectfully traverse Examiner Hirl's rejections based on the above arguments.

Claim 17
(a) Berry (p.253, line 6) does not teach the input of a sample with unknown class for tree application. Instead, Berry inputs the complete training set of preclassified records (known classes) for tree construction.

(b) Berry (p.253, lines 6-12; p 254, lines 1-37; p 255, lines 1-11) does not teach the application of a sample to a regulation tree and repeat the process. Instead, Berry taught measures used to determining the best split of the tree in tree construction (not in tree application). Current invention is patentably distinctive from Berry.

(c) Berry (p.253, lines 6-12; p 254, lines 1-37; p 255, lines 1-11) does not teach the combination of the results from all trees which is a patentable new method and is un-suggested in prior arts.

Applicant respectfully traverse Examiner Hirl's rejections based on the above arguments.

Claims 20-21
Berry (p.253, lines 6-12; p 254, lines 1-37; p 255, lines 1-11) does not teach the generation of a new weight for each training sample. Berry only taught measures used to determining the best split of the tree. The generation of new weight is a patentable new method of the current invention and is un-suggested in prior arts including Berry.

Applicant respectfully traverse Examiner Hirl's rejections based on the above argument.

Claims 22
(a) Berry (p.253, line 6) does not teach the input of a sample with unknown class for tree application. Instead, Berry inputs the complete training set of preclassified records (known classes) for tree construction. Current invention is patentably distinctive from Berry.

(b) Berry (p.253, lines 6-12; p 254, lines 1-37; p 255, lines 1-11) does not teach the classification a sample to a first regulation tree. Instead, Berry taught measures used to determining the best split of the tree in tree construction (not in tree application).

(c) (d) Berry (p.258, Fig. 12.9 and lines 4-13) does not teach the conditionally selects the final result from the first tree and the focusing tree. Instead, Berry taught the selection of subtrees in tree construction (not in tree application). The focusing tree application method that conditionally selects the final result from the first tree and the focusing tree is a patentable new method and is un-suggested in prior arts including Berry.

Applicant respectfully traverse Examiner Hirl's rejections based on the above argument.

Claims 24
The multi-stage focusing trees include multiple trees. Berry (p.253, lines 6-12; p 254, lines 1-37; p 255, lines 1-11) does not teach the creation of multiple trees. It taught the creation of a single tree with multiple levels. Current invention is patentably distinctive from Berry.

Applicant respectfully traverse Examiner Hirl's rejections based on the above argument.

Conclusion

In view of the amendments and above remarks and arguments, Applicant submits that all claims are patentably over the prior art and all claim rejections under 35 USC §112, 35 USC §101 and 35 USC §103 are overcome. Therefore Applicant submits that this application is in condition for allowance, which action Applicant respectfully solicits.

Conditional Request for Constructive Assistance

If for any reason this application is not believed to be in full condition for allowance, Applicant respectfully requests the constructive assistance and suggestions of the Examiner pursuant to MPEP para. 707.07(j) in order that the undersigned can place this application in allowable condition as soon as possible and without the need for further proceedings.

Respectfully submitted,

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